

Abstract of the Disclosure

A liquid crystal polarization rotator device is able to rotate polarization fast enough to compensate polarization mode dispersion. The amount or degree of rotation is rapidly reconfigurable. The device includes a cavity filled with a nematic liquid crystal material. The cavity has electrodes on a first face, e.g., a first substrate, and electrodes on a second face, e.g., a second substrate, opposite the first face. The electrodes are shaped and positioned to produce an electric field across the cavity capable of rotating the alignment direction of the molecules of the liquid crystal material in the cavity. The electrodes are patterned on the ends of optical fibers. Aligning and positioning of the electrodes on the ends of the optical fibers with a predetermined spacing forms the cavity that is filled with the nematic liquid crystal material. The filled cavity is a so-called liquid crystal microcell wave plate. A control system is used to control the "rapid" rotation of the alignment direction of the molecules of the liquid crystal material. The control system receives data regarding the polarization of light entering or leaving the microcell and adjusts the direction of the electric field also using trigger pulses such as to rotate the nematic liquid crystal material molecules by a first predetermined number of degrees greater than a second desired number of degrees of rotation. Then, the trigger pulses for the electric field are stopped after the molecules have rotated by the second desired number of degrees. In this manner, the molecules rotate by the second desired number of degrees much faster than if a pulse had been applied with the same speed to rotate them by the second desired number of degrees in the first place.